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LEE & HAYES, PLLC
601 W. RIVERSIDE AVENUE
SUITE 1400
SPOKANE, WA 99201

EXAMINER	
YUAN, KATHLEEN S	

ART UNIT	PAPER NUMBER
2624	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/621,260	XIAO ET AL.	
	Examiner	Art Unit	
	KATHLEEN S. YUAN	2624	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *09 March 2009*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-70* is/are pending in the application.

4a) Of the above claim(s) *2-25,32-40,42,46-50,52-54,56,60-66 and 68-70* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,26-31,41,43,44,45,51,55,57-59,67* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

The response received on 3/12/2009 has been placed in the file and was considered by the examiner. An action on the merit follows.

Response to Amendment

1. The amendments filed on 2009 March 12 have been fully considered. Response to these amendments is provided below.

Summary of Amendment/ Arguments and Examiner's Response:

2. The applicant has amended the claims to include details about the boosting chain and has argued that prior art do not teach the amended limitations.

3. Applicant's arguments with respect to the claims have been considered but are moot in view of the new ground(s) of rejection.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claims 55, 57-59 and 67 are rejected under 35 U.S.C. 103(a) as being unpatentable over "Robust Real-Time Object Detection" (Viola et al) in view of U.S>

Patent Application Publication No. 20060088894 (Wright et al) and noted with "Neural Network Based Face Detection (Rowley et al).

Regarding claim 55, Viola et al discloses an apparatus, that which does all the processing of Viola comprising: logic (tables 1 and 2, whole document describes the logic) operatively configured to detect at least one human face within a digital image (page 1, paragraph 2, lines 2-3) using a multiple stage face detection process (page 2) that includes: a boosting filter stage to process a set of initial candidate portions of digital image data carried out by AdaBoost using a boosting chain (fig. on page 12) to produce a set of intermediate candidate portions (page 2, paragraph 4), wherein the boosting chain includes a plurality of boosting chain nodes/ classifiers (1, 2, 3 are the three nodes shown on the fig. on page 12) to identify candidate portions (page 12, paragraph 3 and fig. on page 12, the output of further processing), and a function following each of the plurality of boosting chain nodes during training, since each classifier contains a function that processes negative examples to see if there are many false positives (page 14, paragraph 3), and the function uses false alarms collected from non-face image sets (table 2, N) as a negative training set to initiate a subsequent boosting chain node by creating another layer if there are too many false alarms (page 14, paragraph 3). It is noted that Rowley et al discloses it is known in facial detection that training sets by using non-faces is called a "bootstrap method" (page 1, paragraph 3- page 2, paragraph 1); therefore, since the same is being done in Viola, Viola discloses such a bootstrap function. Furthermore, Viola et al discloses a post-filter stage configured to process said set of intermediate candidate portions to produce a set

of final candidate portions; "promising regions" (page 2, paragraph 5). The post filter stage is more complex processing of finding a face (page 2, paragraph 5).

Viola does not disclose expressly the apparatus comprises a processor and a memory with instruction executable by the processor and that the bootstrap/ Negative training method uses a weak learner of a previous boosting chain node in training another boosting chain node of the boosting chain.

Wright et al discloses it is known to carry out a set of instructions using a processor and memory with instructions executable by the processor (page 2, paragraph 15) and that in training a boosting chain using negative training sets, a weak learner of a previous boosting chain node, what Wright et al calls a "stump", is used in training another stump by using the previous 4 misclassifications and weights/ weak learners of the previous stump (page 17, paragraph 133).

Viola and Wright et al are combinable because they are from the same field of endeavor, i.e. training a boosting chain for region classification.

At the time of the invention, it would have been obvious to a person of ordinary skill in the art to train the boosting chain using the previous weak learners.

The suggestion/motivation for doing so would have been to provide a more accurate recognition by learning from earlier mistakes.

Therefore, it would have been obvious to combine the method of Viola et al, as noted with Rowley, with the learning of Wright et al to obtain the invention as specified in claim 55.

6. Regarding claim 57, Viola et al discloses processing said plurality of portions using a pre-filter stage that is configured to output said set of initial candidate portions selected from said plurality of portions based on at least one feature, a Haar- like feature (page 2, paragraph 3).

7. Regarding claim 58, Viola et al discloses that the feature is a Haar- like feature (page 2, paragraph 3, lines 3-4).

8. Regarding claims 59, by reinterpreting the pre-filter stage of Viola et al as being the first part "the integral image" (page 2, paragraph 3) and also part of the AdaBoost procedure as well from page 2, paragraph 4 and figure 6, items 1 and 2, the boosting chain step will be interpreted as the rest of the AdaBoost procedure that is not part of the pre-filter stage (fig. 6, item 3), and the post filtering stage is the "further processing" of fig. 6. Therefore, Viola et al discloses that the pre-filter stage includes a linear filter, since items 1 and 2 are filtering out rejections and are arranged in a linear fashion. The filter is based on a weak learner (page 12, paragraph 1), and also on the weak learner as interpreted from Wright et al, above.

9. Regarding claim 67, Viola et al employs a feature-based algorithm in a prefilter stage (page 2, paragraph 3) and the feature includes a Haar-like feature (page 2, paragraph 3, lines 3-4).

10. Claims 1, 26-31, 41, 43-45 and 51 are rejected under 35 U.S.C. 103(a) as being and unpatentable over Viola et al in view of Wright et al and "A Subspace Approach to Face Detection with Support Vector Machines" (Ai et al) and noted with Rowley et al.

Regarding claim 1, Viola et al discloses a method for use in detecting faces within a digital image (page 1, paragraph 2, lines 2-3), the method comprising: processing, in a processor, that which carries out the process of Adaboost such as the Intel Pentium III (page1-2, paragraph 2) in a boosting filter stage, a set of initial candidate portions that are "integral images", of digital image data, in a boosting filter stage that uses a boosting chain (fig on page 12), or interpreted as each stage as part of a chain, carried out by AdaBoost to produce a set of intermediate candidate portions (page 2, paragraph 4); and processing said set of intermediate candidate portions in a post-filter stage to produce a set of final candidate portions, "promising regions" (page 2, paragraph 5). The post filter stage is more complex processing of finding a face (page 2, paragraph 5). Viola et al further discloses that the boosting filter stage includes a chain having a plurality of boosting chain nodes/ classifiers (1, 2, 3 are the three nodes shown on the fig. on page 12) to identify candidate portions (page 12, paragraph 3 and fig. on page 12, the output of further processing), and a function following each of the plurality of boosting chain nodes during training, since each classifier contains a function that processes negative examples to see if there are many false positives (page 14, paragraph 3). It is noted that Rowley et al discloses it is known in facial detection that training sets by using non-faces is called a "bootstrap method" (page 1, paragraph 3- page 2, paragraph 1); therefore, since the same is being done in Viola, Viola discloses such a bootstrap function.

Viola does not disclose expressly that more complex processing to find a face includes an image pre-processing process, a color-filter process, and a support vector

machine process and that the bootstrap/ Negative training method uses a weak learner of a previous boosting chain node in training another boosting chain node of the boosting chain.

Wright et al discloses it is known to carry out a set of instructions using a processor and memory with instructions executable by the processor (page 2, paragraph 15) and that in training a boosting chain using negative training sets, a weak learner of a previous boosting chain node, what Wright et al calls a "stump", is used in training another stump by using the previous 4 misclassifications and weights/ weak learners of the previous stump (page 17, paragraph 133).

Viola and Wright et al are combinable because they are from the same field of endeavor, i.e. training a boosting chain for region classification.

At the time of the invention, it would have been obvious to a person of ordinary skill in the art to train the boosting chain using the previous weak learners.

The suggestion/motivation for doing so would have been to provide a more accurate recognition by learning from earlier mistakes.

Viola (as modified by Wright and noted with Rowley et al) does not disclose expressly that more complex processing to find a face includes an image pre-processing process, a color-filter process, and a support vector machine process

Ai et al discloses a way of finding a face includes an image pre-processing process: creating a skin color model or training images, etc (fig. 1), a color-filter process (fig. 1, "Skin color segmentation), and an SVM process (fig. 1, "Linear SVM classifier").

Viola et al (as modified by Wright and noted with Rowley et al) and Ai et al are combinable because they are from the same field of endeavor, i.e. facial image detection.

At the time of the invention, it would have been obvious to a person of ordinary skill in the art to use the process of pre-processing, color-filtering, and SVM to detect faces.

The suggestion/motivation for doing so would have been to provide the most robust method by providing an easier and efficient way to find faces.

Therefore, it would have been obvious to combine the boosting chain of Viola (as modified by Wright and noted with Rowley et al) with the face detection of Ai et al to obtain the invention as specified in claim 1.

11. Regarding claim 41, Viola et al discloses a computer-readable medium having computer-implementable instructions for causing at least one processing unit to perform acts comprising: detecting possible human face image data within a digital image (page 1, paragraph 2, lines 2-3) using a multiple stage face detection scheme (page 2) that includes: a boosting filter stage to process a set of initial candidate portions of digital image data carried out by AdaBoost to produce a set of intermediate candidate portions (page 2, paragraph 4), using a plurality of boosting chain nodes (fog. On page 12, classifiers 1,2, and 3) and a boot strap function (as noted above in the citation of Rowley et al) following each of the plurality of boosting chain nodes during training, since each classifier contains a function that processes negative examples during training (page 14, paragraph 3), the boot strap function to: collect false alarms in non—

face image sets (table 2, N) from the boosting chain nodes/ classifiers by finding the images that are false positives (page 14, paragraph 3), use the false alarms as a negative training set having adjusted weights by using them to show the classifier is not sufficient, and training the cascade to contain more nodes and adjusting the weight of false positives in the false positive rate (page 14, paragraph 3), and using the negative training set to initiate a subsequent boosting chain node by creating another classifier if there is a high false positive rate (page 14, paragraph 3) and a post-filter stage configured to process said set of intermediate candidate portions to produce a set of final candidate portions, "promising regions" (page 2, paragraph 5). The post filter stage is more complex processing of finding a face (page 2, paragraph 5). Viola does not disclose expressly that more complex processing to find a face includes an image pre-processing process, a color-filter process, and a support vector machine process and that the boot strap function/ negative training function adjusts a sample weight initialized for a current boosting classifier of a current boosting chain node based on a classification error rate of a previous boosting chain node. Ai et al discloses a way of finding a face includes an image pre-processing process: creating a skin color model or training images, etc (fig. 1), a color-filter process (fig. 1, "Skin color segmentation), and an SVM process (fig. 1, "Linear SVM classifier"). Wright et al discloses "stumps" as nodes, wherein a sample weight initialized for a current boosting stump is adjusted/ increased for misclassified observations, therefore, based on a classification error rate of a previous stump (page 17, paragraph 133).

12. Regarding claim 26, Viola et al discloses processing said plurality of portions using a pre-filter stage that is configured to output said set of initial candidate portions selected from said plurality of portions based on at least one feature, a Haar- like feature (page 2, paragraph 3); therefore, Viola et al employs a feature-based algorithm in a prefilter stage.. Furthermore, the entire process uses many feature-based algorithms (page 3, paragraph 5).

13. Regarding claim 27, Viola et al discloses that at least one feature based algorithm uses Haar-like features (page 4, paragraph 2).

14. Regarding claim 28, Viola et al discloses that at least one feature-based algorithm uses extended features (fig. 1, D, which corresponds to fig. 12c of the applicant's specification which is extended features).

15. Regarding claim 29, Viola et al discloses at least one feature-based algorithm uses mirror invariant features (fig. 1, c, which corresponds to fig. 12e of the applicant's specification of mirror invariant features).

16. Regarding claim 30, Viola discloses that an extra constraint of the mirror invariant, the 2nd white box in fig. 1, is added to reduce the size of a feature set associated with the mirror invariant features,)page 4, paragraph 2).

17. Regarding claim 31, Viola et al discloses at least one feature-based algorithm uses variance features (fig. 1, A, which corresponds to fig. 12h of the applicant's specification of variance features.)

18. Regarding claim 43, Viola et al discloses processing said plurality of portions using a pre-filter stage that is configured to output said set of initial candidate portions

selected from said plurality of portions based on at least one feature, a Haar- like feature (page 2, paragraph 3).

19. Regarding claim 44, Viola et al discloses that the feature is a Haar- like feature (page 2, paragraph 3, lines 3-4).

20. Regarding claims 45, by reinterpreting the pre-filter stage of Viola et al as being the first part "the integral image" (page 2, paragraph 3) and also part of the AdaBoost procedure as well from page 2, paragraph 4 and figure 6, items 1 and 2, the boosting chain step will be interpreted as the rest of the AdaBoost procedure that is not part of the pre-filter stage (fig. 6, item 3), and the post filtering stage is the "further processing" of fig. 6. Therefore, Viola et al discloses that the pre-filter stage includes a linear filter, since items 1 and 2 are filtering out rejections and are arranged in a linear fashion. The filter is based on a weak learner (page 12, paragraph 1) and also on the weak learner as interpreted from Wright et al, above in the rejection for claim 1.

21. Regarding claim 51, Viola et al employs a feature-based algorithm in a prefilter stage (page 2, paragraph 3) and the feature includes a Haar-like feature (page 2, paragraph 3, lines 3-4).

Conclusion

22. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to KATHLEEN S. YUAN whose telephone number is (571)272-2902. The examiner can normally be reached on Monday to Thursdays, 9 AM to 5 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Brian Werner can be reached on (571)272-7401. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

KY
6/9/2009

/Aaron W Carter/
Primary Examiner, Art Unit 2624